WE CLAIM:

1. A process of depositing a thin film of aluminum oxide on a substrate in a reaction chamber by an atomic layer deposition (ALD) process comprising a plurality of cycles, each cycle comprising:

supplying a first reactant comprising a gaseous aluminum compound, wherein no more than about one monolayer chemisorbs on the substrate; and

supplying a gaseous second reactant comprising a source of oxygen other than water, wherein the second reactant converts the adsorbed portion of the first reactant on the substrate to aluminum oxide,

wherein the substrate is maintained at a temperature of less than 190°C during the ALD process.

2. The process of Claim 1, wherein the gaseous aluminum compound comprises at least one alkyl group bound to aluminum.

3. The process of Claim 1, wherein the gaseous aluminum compound has a formula selected from the group consisting of L^1AlX_2 (I), L^1L^2AlX (II) and $L^1L^2L^3Al$ (III), wherein X is selected from the group consisting of H, F, Cl, B, I, and an alkoxy group, and L^1, L^2 and L^3 are linear or branched saturated or unsaturated hydrocarbons.

4. The process of Claim 1, wherein the gaseous second reactant comprises one or more compounds selected from the group consisting of ozone, organic ozonides, oxygen atoms with unpaired electrons, organic peroxides and organic peracids.

5. The process of Claim 1, wherein the gaseous second reactant comprises one or more organic peroxides with the formula R^1-O-O-R^2 (IV), wherein R^1 is a linear, branched or cyclic organic ligand, and wherein R^2 is hydrogen or a linear, branched or cyclic organic ligand.

6. The process of Claim 1, wherein the substrate is maintained at a temperature of less than 150°C during the ALD process.

7. The process of Claim 6, wherein the substrate is maintained at a temperature of less than 140°C during the ALD process.

8. The process of Claim 7, wherein the substrate is maintained at a temperature of less than 130°C during the ALD process.

9. The process of Claim 1, wherein the ALD cycle is repeated a sufficient number of times to deposit a layer of aluminum oxide with a thickness of between about 5 nm and about 1000 nm on the substrate.

10. The process of Claim 9, wherein the ALD cycle is repeated a sufficient number of times to deposit a layer of aluminum oxide with a thickness of about 25 nm to about 75 nm.

11. The process of Claim 1, wherein the substrate comprises an organic light emitting layer.

12. The process of Claim 1, wherein the substrate comprises a surface acoustic wave filter.

13. The process of Claim 1, wherein the substrate comprises an organic solar cell layer.

14. A process of depositing a thin film of aluminum oxide on a substrate that is sensitive to moisture by an atomic layer deposition (ALD) process comprising a plurality of cycles, each cycle comprising:

supplying a first reactant comprising a gaseous organic aluminum compound, wherein no more than about one monolayer chemisorbs on the substrate; and

supplying a gaseous second reactant comprising a source of oxygen other than water, wherein the second reactant converts the adsorbed portion of the first reactant on the part to aluminum oxide,

wherein the substrate is maintained at a temperature of less than 190°C during the ALD process.

15. The process of Claim 14, wherein the thin film protects the substrate from moisture.

16. The process of Claim 14, wherein the thin film is deposited on an aluminum oxide layer that was previously deposited by chemical vapor deposition or physical vapor deposition.

17. A process of depositing a thin film of aluminum oxide on a substrate that is sensitive to the atmosphere by an atomic layer deposition (ALD) process comprising a plurality of cycles, each cycle comprising:

supplying a first reactant comprising a gaseous aluminum compound, wherein no more than about one monolayer chemisorbs on the substrate; and

supplying gaseous ozone, wherein the ozone converts the adsorbed portion of the first reactant on the part to aluminum oxide,

wherein the substrate is maintained at a temperature of less than 190°C during the ALD process.

18. The process of Claim 17, wherein the thin film protects the substrate from the atmosphere.

19. The process of Claim 17, wherein the thin film is deposited on an aluminum oxide layer that was previously deposited by chemical vapor deposition or physical vapor deposition.

20. A substrate comprising a thin film of aluminum oxide deposited thereon by an ALD process comprising a plurality of cycles, wherein the substrate is maintained at a temperature of less than 150°C during the ALD process.

21. The substrate of Claim 20, wherein the thin film protects the substrate from moisture.

22. A process of depositing a thin film of aluminum oxide on a substrate in a reaction chamber by an atomic layer deposition (ALD) process comprising a plurality of cycles, each cycle comprising:

supplying a first reactant comprising a gaseous aluminum compound, wherein no more than about one monolayer chemisorbs on the substrate; and

supplying a gaseous second reactant comprising a source of oxygen selected from the group consisting of ozone, organic ozonides, oxygen atoms with unpaired electrons, organic peroxides and organic peracids , wherein the second reactant converts the adsorbed portion of the first reactant on the part to aluminum oxide,

wherein the substrate is maintained at a temperature of less than 190°C during the ALD process.